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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
KLAUS BOHMHAMMEL, ET AL.	: EXAMINER: NGUYEN, N.Y.M.
SERIAL NO: 10/586,369	:
FILED: JULY 18, 2006	: GROUP ART UNIT: 1793
FOR: METHOD FOR THE PRODUCTION OF HSICL3 BY CATALYTIC HYDRODEHALOGENATION OF SICL4	:

PRE-APPEAL BRIEF REQUEST FOR REVIEW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the Advisory Action of August 10, 2009 and the final Office Action of June 10, 2009, Applicants request pre-appeal review of the rejections in the present application in view of the following remarks submitted concurrently with a Notice of Appeal.

REMARKS

Applicants submit the rejections in the present application suffer from legal and/or factual errors meriting withdrawal of the rejections. In particular, the allegedly obvious modification of the cited art contradicts the express disclosure of the cited references.

Present Claim 1 is drawn to a process for the catalytic hydrodehalogenation of $SiCl_4$ to form $HSiCl_3$. The process includes contacting a mixture of hydrogen (H_2) and silicon

tetrachloride ($SiCl_4$) with a heating element made of metal to form $HSiCl_3$. The chemistry of this process may be depicted by the following chemical reaction:

$$H_2 + 2\ SiCl_4 \rightarrow 2\ HSiCl_3 + 2\ HCl$$

The Office takes the position that the presently claimed process is obvious in view of a combination of Yamanaka (U.S. 6,653,212); Rodgers (U.S. 3,933,985); and JP '017 (JP 57-118017). The Office cites to JP '017 as evidence that processes for reacting $SiCl_4$ with H_2 in the presence of a *non-metallic* heating element are known (see page 3, line 7 through page 4, line 8 of the June 10, 2009 Office Action). The Office admits that JP '017 does not disclose using a heating element made of metal to carry out the reaction of $SiCl_4 + H_2$ to form $HSiCl_3$ (see the last full paragraph on page 4 of the June 10, 2009 Office Action).

The Office relies on Yamanaka as evidence that it would be obvious to replace the non-metallic heating element described in JP '017 with the metal heating element described in Yamanaka (see page 4, line 19 through page 6, line 6 of the June 10, 2009 Office Action).

Yamanaka discloses a method for the thin film deposition of Si to produce a semiconductor device (see column 1, lines 8-5 of Yamanaka). Yamanaka describes a process in which a gaseous precursor is heated in the presence of a metallic heating element to form a Si film. Yamanaka discloses the following in this regard:

> ...the relationships between the formed metal thin films and the material gases (reaction gases) are as follows. Note that, as the carrier gas, preferably use is made of an inert gas such as He, H_2, Ar, or N_2.
>
> 1. For the formation of a film of Si and Poly-Si, use is made of SiH_4, $SiHCl_3$, SiH_2Cl_2, $SiCl_4$, and SiH_6, ,...

See column 48, lines 48-54 and page 6, lines 7-8 of the June 10, 2009 Office Action.

The process of forming a Si film from the reaction gases described in Yamanaka can be represented chemically as follows:

$$SiH_4 \rightarrow Si + 2\ H_2$$

$SiHCl_3 \rightarrow Si + HCl + Cl_2$

$SiH_2Cl_2 \rightarrow Si + 2\ HCl$

$SiCl_4 \rightarrow Si + 2\ Cl_2$

$SiH_6 \rightarrow Si + 3\ H_2$

Importantly, Yamanaka describes the carrier gases, e.g., H_2, as **inert** gas. Applicants submit that this is readily understood by those of ordinary skill in the art that the carrier gas does not participate in any reactions taking place during the Yamanaka process.

The reaction processes of JP '017 and Yamanaka are substantially different. In JP '017, $SiCl_4$ is reacted with H_2 to form $HSiCl_3$. Such a reaction is not possible in Yamanaka because the H_2 is inert.

Yamanaka does not disclose the use of a heating element made of metal to carry out the reaction of JP '017. In fact, to the contrary, Yamanaka discloses that the Si metal precursors should be treated in a way such that H_2 is inert and does not react with the Si precursor.

The Office's assertion that it would be obvious to use the Yamanaka catalyst (e.g., metallic heating element) in the JP '017 process to contact a mixture of H_2 and $SiCl_4$ is not correct because Yamanaka discloses that H_2 is inert when $SiCl_4$ is contacted with a metallic heating element in the presence of H_2. If the H_2 is inert, the reaction between H_2 and $SiCl_4$ will not take place. The Office's assertion that one of ordinary skill in the art would have been led to the presently claimed invention based on the combined disclosures of Yamanaka and JP '017 is thus not supportable.

As discussed above, the Office relies on Rodgers in combination with Yamanaka and JP '017 in support of the rejection. The Office relies on Rodgers as evidence that H_2 reacts with $SiCl_4$ to form $SiHCl_3$ (see the last full paragraph on page 6 of the June 10, 2009 Office Action). The Office extends this disclosure of Rodgers and asserts:

> ... the thermal catalyst in Yamanaka '212 may serve as a catalyst to promote the formation of $SiHCl_3$ from $SiCl_4$ first, before the $SiHCl_3$ is converted to Si film.

See the first full paragraph on page 7 of the June 10, 2009 Office Action.

Applicants submit that the Office's combination of JP '017, Yamanaka and Rodgers is improper because it ignores the disclosure in Yamanaka that H_2 is inert under the conditions of the Yamanaka process. Thus, irrespective of the Office's reliance on Rodgers, the combination of JP '017, Yamanaka and Rodgers is insufficient for setting forth a *prima facie* case of obviousness at least for the reason that the Office has not shown that one of ordinary skill in the art would in fact use a metal resistor to react H_2 with $SiCl_4$ to form $HSiCl_3$.

Further with respect to the combination of JP '017, Yamanaka and Rodgers, Applicants submit that those of ordinary skill in the art would not modify Yamanaka in view of Rodgers for the reason that Rodgers teaches away from such a modification.

As discussed above, Yamanaka discloses a process for forming a thin film of Si. The process of Yamanaka heats a Si precursor in the presence of a metal resistor such as $SiCl_4$ in a vacuum apparatus to deposit Si metal (see column 48, lines 48-54 of Yamanaka). *Rodgers discloses that the formation of Si metal should be avoided.* See for example, column 3, lines 17-32 of Rodgers:

> Care must be taken in operation of the process in accordance with the invention to prevent deposition of silicon within the reaction furnace 14 since the silicon acts as a catalyst or nucleating agent in favor of reaction (1) rather than in favor of the formation of trichlorosilane (reaction 2), as is desired. To avoid formation of any silicon in the reaction furnace, it is therefore desirable that a minimum of 5% silicon tetrachloride be maintained in the feed to the reaction chamber ...

Rodgers directly contradicts the process of Yamanaka. Where Rodgers expressly avoids the formation of Si metal, the entire purpose of the Yamanaka process is to form Si

metal. Applicants submit that the contradictions between the Yamanaka and Rodgers references teaches away from their combination and thus one of ordinary skill in the art would not modify Yamanaka in the manner of Rodgers.

As discussed above in detail, Applicants submit that the Office's assertion of obviousness is not supportable in view of the substantial differences between the cited references and the Office's failure to set forth a *prima facie* case of obviousness.

Applicants request withdrawal of the rejection and the allowance of all now-pending claims.

Respectfully submitted,

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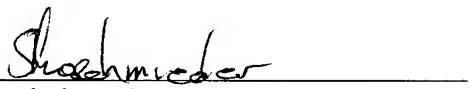

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